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Treatment of Seasickness.

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REPRINTED FROM THE
New York Medical Journal
for August 13, 1892.



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NATURE AND PREVENTIVE TREATMENT OF
SEASICKNESS.

BY W. W. VAN VALZAH, A. M., M. D.

NOWADAYS inventive genius and the progress of science have made travel by sea rapid and safe. The great steamers pass quickly and triumphantly against wind and wave from point to point and from shore to shore. The world is made smaller, nation is drawn closer to nation. Seasickness is the chief barrier that remains; it is the almost certain affliction of those who use this mode of travel, be it for health, pleasure, education, or the purposes of trade. This peculiar form of vertigo it is that Neptune imposes as a tax on all of his subjects, except a favored few. It is estimated that only about three per cent. of all sea-goers are exempt.

Mechanical science has very materially shortened the duration of the disease by increasing the rapidity and comforts of travel. The layman has pretty thoroughly discussed the subject, and seems never to tire when considering its humorous side. The medical profession has done very little and written and thought less. It is with the desire to excite serious study of this neglected disease that this article is written. No effort is made to discover "some

new thing"; no claim will be made for originality. The united thought of the profession may be able to lift the cloud that obscures the nature of the trouble, and devise some means for its prevention or alleviation.

On account of the nature and limited adaptability of our organism, which is fitted by creation and habit to life on the stable and solid land, on account of the great change in the environment when on the restless sea, it is folly to hope that the evil can be wholly overcome. So long as the rolling and pitching ship is at the mercy of every wave, and, impressing its restlessness on every object that can be felt and seen, takes from us the guides and governors of co-ordination and of equilibration; so long as these disordering and uncorrected sensory impressions possess correlatives in consciousness, the vertigo of mariners will be produced. For seasickness is essentially and primarily a disordered sense of equilibrium and of space, a sensory form of vertigo.

The symptoms and their order and manner of development confirm this view. The first and essential sign of every case of seasickness is a feeling of dizziness or lightness of the head or vertigo. It is the most invariable and the most persistent, and sometimes the only symptom. It is alone present in the prelude, though overshadowed is never absent from the scene, and is the last to leave the stage when the curtain falls. It is commonly associated with headache, an indefinable nervousness, sensitiveness to light, a contracted pupil, and a keen sense of smell. The temper is extremely irritable, the face is flushed or pale, or rapidly changes from the one to the other state—the vasomotors and inhibition are struggling for the mastery. The condition is one of hyperæmia and instability of the sensory and sympathetic nerve centers. These epiphenomena may be absent and the voyage completed with only varying

degrees of vertigo. But more often the simple vertigo is followed by nervous exhaustion and mental depression, muscular inco-ordination and relaxation, a weak heart, low arterial tension, salivation, nausea, and vomiting. The irritability of weakness supplants the sensory excitement, and the vertigo is increased by the cerebral anæmia.

Thus we have three pretty well defined forms or degrees of seasickness—sensory vertigo, sensory vertigo with cerebro-spinal irritability, and vertigo with prostration.

The form and degree and duration of the attack depend on the nature and intensity of the movements of the ship, on the susceptibility and adaptability of the individual, and the incidence of the disturbance. When the cerebro-spinal system is most involved, vertigo, headache, and nervousness are marked; when the sympathetic is weakest, the nausea, vomiting, and prostration are most prominent.

The nervous irritability may be explained as the result of the cerebral excitement and the uncommon and numerous sensory impressions. The cerebro-spinal hyperæmia is due partly to the increase of functional activity and partly to the tonic contraction of all the muscles driving the blood out of the musculo-venous reservoir. Every peripheral excitation determines neural discharges and causes an augmentation of potential energy. It is also well known that the pupil contracts under the influence of exciting sensations, as does also the whole reflex muscular system.

The vomiting, in the popular mind, constitutes the essential part of the malady. Many physicians, it must be admitted, adopt this idea and embody it in their treatment. Now, we would state with emphasis that acute dyspeptic attacks must not be confounded with seasickness. Acute dyspepsia is a powerful predisposing cause of the disease, but has no relation whatever to the movements of the ship.

The cause must be sought in overeating, irregular habits, loss of sleep, overwork, worry, anxiety, grief, the abuse of drugs—in some gross violation of the hygiene of digestion. The disturbance of the stomach is primary and would have occurred under similar circumstances on land. The vomiting of seasickness seems to be the effect of the cerebral anæmia produced by the weak heart, vaso-motor disturbance, and muscular relaxation—all due to paresis of the sympathetic from fatigue of the nerve centers by sensory over-excitation, or from emotive shock, or from excessive inhibition through a sense of defective motor innervation and of failure to preserve the equilibrium of the body.

From this analysis it will appear that the symptoms referable to the nervous system are primary and controlling, and that the essential sign of seasickness is vertigo. This, then, limits the explanation to the production of the vertigo by the ever-varying and complicated movements of the ship, for all observers agree that this is the remote cause. How is the vertigo produced?

The process is not a simple one. Many theories fall short of the mark because they do not include enough; because it is incorrectly assumed that only one line connects the cause with the effect. It is my purpose to show that the motion of the ship is connected with the vertigo by many routes—that the mechanical cause splits up and reunites in the biological effect. On the one hand we have the movements of the ship, and on the other are the disturbed sense of equilibrium and of space manifest in consciousness as vertigo. How, then, do the movements of the ship disturb these two senses in this peculiar manner?

It is foreign to our purpose to discuss the nature of the sense of equilibrium, whether it be the correlate in consciousness of afferent sensory impressions or a central sense of motor innervation. Nor would anything be gained by

disproving the existence of so-called spinal and muscular perception. It is the reality and composition and not the location of the sense of equilibrium with which we are concerned. The sense of equilibrium is a compound one and is correlated in consciousness with many peripheral impressions—muscular, tactile, labyrinthine, visual, and from pressure. Through the muscular we are cognizant of the state and position of a part as related to the rest of the body. By the other sensory impressions we are informed as to the relation of the body to surrounding objects and to the vertical position. Now, the perfection of the sense of equilibrium is dependent on the integrity of the sensory impressions which compose it. When the information is false or falsely interpreted, the motor innervation will be wrong and the result bewildering. When the perception of relations is incomplete and deceptive and uncorrected, there result inco-ordination and unsteadiness and vertigo.

The disordered sense of equilibrium is sufficient alone to produce the vertigo of mariners, for the blind are not exempt. Deafness seems to confer a certain degree of immunity, and closing the eyes will often diminish the vertigo. It is through the sense of sight and the perception of the muscular changes of convergence and divergence and accommodation that the sense of space is built up. Insufficiency and inco-ordination of the ocular muscles often give rise to vertigo. It is through the eye also that we are chiefly made cognizant of our position in space. Where the perceiving subject is in motion, the false perception of relations is projected outward as an illusion of moving objects. The subjective feeling of this disorder is vertigo. The dizziness of high altitudes and openness or void arise from a disordered sense of space.

Vertigo may be divided into three large classes: It may be cardio-vascular, as the vertigo of cerebral anæmia

or of arterial sclerosis; it may be of central origin, as the vertigo of properly located brain tumors; or it may be the peripheral or sensory form, of which the vertigo of Menière's disease and seasickness may be taken as a type. We have already stated that the vertigo of seasickness with prostration is partly due to cerebral anæmia, or, in other words, is also cardio-vascular. But the essential and primary vertigo is of a purely sensory origin.

The preservation of equilibrium is dependent on (1) the integrity of afferent impressions; (2) on proper motor innervation guided by past experience, and grouped and limited so as to produce a purposive movement or maintain a definite relative position; (3) on proper muscular response; (4) the result of which is reflected to the co-ordinating and higher centers, and there is appreciated as efficient or defective. When on an irregularly moving body, none of these conditions can be realized, and on board a ship, in a rough sea, the difficulty may be insurmountable. The sensori-motor nerve circuit carries within itself the power of co-ordination without the connection or intervention of the higher centers, though the higher centers may regulate or control. Equilibration is commonly an unconscious process. We are not conscious of all the peripheral impressions which are co-ordinated into vertiginous movements—we merely have a sense of the defective motor innervation. The defect, the discord, the false association, the confusion of relations, are felt as vertigo if they rise into consciousness or are not displaced by a more potent feeling.

With these explanations turn we now to the consideration of the manner in which the senses of equilibrium and of space are disturbed by the movements of the ship as it pitches or rolls or mixes the two motions. The body is constantly thrown out of equilibrium, and the position of the surface which supports it can not be appreciated.

The sensations of contact and of pressure ever vary in degree and in direction—now slight as the ship sinks, the individual feeling as if left in mid-air—now great as the ship rises and presses against the descending body. The same uncommon and confusing sensory impressions arise also from the movable viscera and internal sensory surfaces, particularly from the semicircular canals, through oscillations of the endolymph or hyperæmia of the auditory center—sensations associated in experience with other positions of the body than that which it now occupies. No change in movement can be anticipated; no position of the body can be thoroughly made out. The sense of sight can not be utilized to correct and guide—an ever-changing point of view amid ever-changing objects—all the sensory impressions which make up the life of relations are bewildering. The fault does not lie in perception, nor in co-ordination, nor in the periphery—the sensory mechanism works perfectly. It is because the sense of want of support and the other peripherally excited afferent impressions are disordering. It is because new sensations from an environment to which the organism is not adapted obtain a false association in consciousness. It is because relations can not be made out as they really are; because the erroneous inferences as to the relations of the body to objects seen and felt are out of harmony with the other sensory impressions; because the results of the efforts to maintain equilibrium can not be verified. And the central confusion and discord and false association are projected into the outer world as illusions of movement and of space—a simple disorder of relations—a sensory form of vertigo. Such seems to be the explanation of the vertigo which is the cardinal sign or synonym of seasickness.

There are few subjects at once so unsettled and so speculated about as the causation of seasickness. It is not

contended that the view here set forth is complete and final. But it is believed to contain the germ of the truth, and is based on the study of the symptoms in the light of physiology and pathology. It best explains all the phenomena, and the cause acting in the manner indicated will produce the vertigo to which, and to the condition of the cerebro-spinal and ganglionic nerve centers, all the symptoms are sequential.

It would be interesting to state briefly and in the order of their publication the theories which at some time commanded the most consideration and credence :

1. It is due to fear (Plutarch), proof of which is that infants who can not reason and animals are exempt (Gérépratte).

This theory is only interesting because it still survives in the pretty widespread belief that the development of seasickness can be influenced or prevented by the exercise of the will and a mental attitude of indifference. Nothing can be more ludicrous than a traveler trying to ward off seasickness by force of will, unless it be a philosopher striving to suppress a toothache or a poet to charm away the gout by the power and sweetness of his song. Strong feelings and powerful emotions can temporarily supplant in consciousness the sensation of vertigo. Animals are not exempt, though they do not vomit. The cause alleged is inadequate, and the evidence is made up of false observation.

2. It owes its existence to sympathy between the brain and peripheral nerves disturbed by the movements of the ship (1756, Gillchrist).

In the early dawn of physiology this is a very shrewd guess.

3. It is due to cerebral congestion and irritation arising from minute concussions of the brain by the fluids of the body during the descent of the ship, analogous to the rise

of the mercury as the barometer is dropped (1810, Wollaston).

Minute concussions would produce headache analogous to that from riding a rough horse, but not vertigo. The onset should always be gradual and slow. Slight movements should have no effect. A simple change in the character or cessation of the movements should never remit or inaugurate the trouble. The cause is inadequate, can not be shown to be operative, and the blood-vessels are fortunately not dead, rigid tubes. Infancy, with its soft blood-vessels, and old age, with its hard arteries, are alike almost exempt.

4. It is produced by the influence of the visceral movements on the diaphragm (1824, Jobard and Kérandreu).

Again the influence is inadequate. The symptoms are not reproduced or explained in the order of their development. And fixation of the viscera by an abdominal band exerts only a slight influence by diminishing the peripherally excited impressions.

5. The movements of the ship in an arc-like zigzag line arouse a centrifugal force which so influences the circulation in the aorta as to diminish the amount of blood going to the brain. The anæmia of the brain results in cerebral depression which through the sympathetic invokes vomiting. This author considers the vomiting a conservative process induced to supplement the deficient quantity of blood sent to the head (1847, Pellarin).

This is an exquisite use of "occult influences" and the reputed "beneficent purposes" of Nature.

6. It is intoxication by a marine miasm developed in the decaying animal and vegetable matter of the sea, and aroused from its hiding-place during the agitation of the water by the ship or wind or wave (1850, Sémanas).

If this theory were fresh from a bacteriological labora-

tory it might command nowadays a great deal of consideration. It was based on a false analogy. But the large doses of quinine recommended may be of benefit by producing anæmia of the semicircular canals (if this condition be true).

7. The proximate cause of seasickness is the heaping of the brain mass upon itself by centrifugal force and subjecting the part to pressure against the bony casement, or to the hurtful centrifugal movements of the cerebro-spinal fluid, which also leave parts of the brain exposed to injury. Preference is given to the latter view (1856, Fonssagrives).

This is a further stage in the development of the mechanical theory, which is fast approaching an absurdity.

8. The proximate cause is hyperæmia of the spinal cord, especially in those segments related to the stomach and muscles concerned in vomiting, induced directly or reflexly by the irritating movements of the brain, spinal cord, abdominal and pelvic viscera, and by jerks on the spinal ligaments. The involuntary muscles are disturbed by the unwonted number of impulses transmitted to them from the preternaturally excited spinal cord (1864, Chapman).

This theory marks the beginning of a new era. A good many threads of truth run like gold through the dark web, and physiology is in an able manner brought to the aid of the old theories of small concussions and mechanical irritations. The treatment by means of the spinal ice-bag does not seem to have increased the comfort of travelers.

9. It seems to be due to the sudden and recurring changes of the relations of the fluids to the solids of the body (1868, Barker).

10. It is due to the disordering movements of the cerebro-spinal fluid, from which results an intermittent anæmia and a certain degree of commotion of the cerebral mass. Children are exempt through expansibility of the fontanelles (1868, Autric).

It does not seem plausible that a force sufficient to cause the fontanelles to bulge would not compress the very yielding blood vessels of childhood, and children with widely open fontanelles are not always exempt.

11. It is due to the continued action on the brain of a certain set of sensations, more particularly the sensation of want of support (Carpenter, Bain, and (1872) Pollard).

This is a development of the very shrewd guess of Gillchrist. It stands at the beginning of new views. The mechanical theories do not seem to have gone much beyond "possibilities" in their explanation of the symptoms. Experiments, observed order of sequences, and logic now turn on a flood of light.

12. Seasickness is a functional disease of the central nervous system, mainly of the brain, but in some instances of the spinal cord also, the result of a series of mild concussions (1880, Beard).

The cause is inadequate, and functional disease of the central nervous system is not very definite or lucid. The preventive treatment by bromization, however, was a great advance in therapeutics.

13. Motion produces sickness by disturbing the endolymph in the semicircular canals, the viscera in the abdomen, and possibly the brain and subarachnoid fluid at its base (1881, Irwin).

14. All the symptoms of seasickness can be explained by paresis of the sympathetic (1887, Skinner).

This is a very important factor, but how is the paresis induced? It is an epiphenomenon, and an important indication in the drug treatment.

15. Vertigo and vomiting are the essential symptoms. The movements of a ship in a storm, particularly its quick descent, cause movements of the cerebro-spinal fluid, and

cerebral blood is displaced, and the brain subjected to shocks and the cerebellum to commotion; or movements of the abdominal viscera and contractions of the diaphragm, with their resulting local action and reflex inhibitory influences (1888, Pampoukis).

16. The symptoms of seasickness are those of cerebral anæmia. The uncommon and disordering movements that are felt derange and diminish reflex muscular tonicity and contraction, which maintain equilibrium and regulate the return venous circulation. Then results a muscular relaxation, of which the loss of equilibrium is the sign and the cerebral anæmia the consequence (1890, Rochet).

It seems that too great prominence is given to loss or diminution of reflex muscular tonicity. Fatigue is chiefly central, and the most highly endowed and the most differentiated tissue is the first to become exhausted. We have seen that in the production of the paresis of the sympathetic and prostration central fatigue is one of the factors. It seems that muscular relaxation would have to be pretty well marked before there could be much interference with the return venous circulation. And vertigo is present when the pupil is contracted under exciting sensations and the traveler is walking in the dark. The theory makes a deferred result the active cause, but withal is the best explanation yet given.

There are varying degrees of susceptibility to the disease. We have seen how powerful a predisposing cause is acute dyspepsia. The anæmic, the neurotic, the neurasthenic yield very readily to it, as do all who have weak and easily excited nerve centers. Athletes in training have been prostrated, while delicate women were laughing at their discomfort. Infancy and old age are more exempt than middle life. Individuals subject to vaso-motor disturbances are predisposed to the malady. All the symp-

toms have been often reproduced on land after the lapse of months by association of ideas.

Seasickness is not a fatal disease. Deaths have been recorded as due to it, but in these cases it only caused the already suspended sword to fall. Seasickness is an evil; it is never "very good at times" (Burton), nor "salutary" (Johnson). All the good effects of sea travel are obtained without it. It is a dangerous malady when organic disease of the heart or blood-vessels, of the stomach, or of the nervous system, or of the lungs, liable to be attended by hæmoptysis, is present. It nearly always delays or disorders menstruation, and, as is well known, has often terminated pregnancy. It sometimes persists for a variable period after the voyage, and some never completely recover their sense of equilibrium and of space.

Bad treatment is the natural sequence of false views of causation. When we know how a symptom or disease is produced, the management becomes rational, though not always efficient. To the consideration of the preventive treatment a few practical suggestions will be added on the management of the attack.

In the prevention of seasickness we work along two lines—the removal of the predisposing causes and the diminution of the action of the exciting ones. In each instance we strike at causation, and the effect of the double blow is commonly satisfactory. My attention was first drawn to this method of prevention by the comparative immunity from seasickness of patients who were under my treatment before and during the voyage for some one of the many disorders and diseases of nutrition. So far my experience with the method has not been very great, only a few more than one hundred cases having been managed in this manner. The number of cases is only large enough to suggest rather than establish the value of the treatment. But if it

be understood that more than half of these travelers had been previously so sick that they turned with horror from the repetition of the voyage, and that more than three fourths of them completed the passage under the influence of my method without the slightest qualm, and subsequently, when neglecting my directions, became fearfully ill, it may be thought advisable to state the method to the profession with a view to having its utility thoroughly tested.

The treatment as directed to the digestive system has one important object in view—to diminish the irritability of the sensory-nerve endings of the mucous lining of the alimentary canal by keeping the digestive tube functionally active, clean, and sweet, and the consequent prevention of acute dyspeptic attacks. And we follow up the advantage thus gained by securing active elimination and perfect assimilation and disassimilation, thus strengthening and saving from the irritation of an impure blood the nerve centers, whose over-excitation and fatigue play so important a rôle in the development of the malady. In a few words, we strive to promote a high degree of healthy nutrition, because we believe that a strong man is best prepared to resist the encroachments of disease. Good nutrition is a well-fitting armor that turns aside many a deadly blow. If we succeed in realizing this high endeavor, I do not believe that the anæmic stage of seasickness will be developed.

Close attention to the hygiene of nutrition will enable us to get the vital processes on a physiological basis. Only a few days will be required for this purpose if there be but slight disorder of one or more of the nutritive processes. The week before sailing is commonly one of excitement, dissipation, and worry. All preparations for the voyage should be completed several days before going aboard.

The bowels regulated by laxatives, the secretions righted and supplemented if requisite, elimination keep free, and a plain, easily digested, and easily assimilated diet should be adopted. In a general way, the sweets and starches should be limited, and lean meats made the staple food. But the age, activity, peculiarities, habits, the needs of general nutrition, the capability of the digestive organs, must all be taken into consideration in the selection of the diet. The means must be varied to suit each special case, for individualization is the secret of success. But the aim is simple and definite, to secure the perfect digestion and assimilation of a sufficient quantity of food to meet the requirements of nutrition. If the patient gets eight hours of restful sleep every night, and feels no pain nor discomfort nor drowsiness after meals, if there is no flatulency, if the urine contains no abnormal coloring matter, nor excess of phosphates, urates, or uric acid, and the stools are normal—we know that the food is being digested, absorbed, and assimilated in sufficient quantity, if there be no loss of strength to meet the demands of life, and that the excretory products are changed into their simplest and most soluble and most unirritating forms. Until this state of nutrition is established the patient is not prepared for the voyage. The same simple and regular and temperate way of living and eating must be observed throughout the passage.

When there is a serious derangement or disease of the digestive system, the proper treatment must be instituted to secure the one aim of healthy nutrition. How this can be undertaken with the greatest hope of success has been outlined by me in articles published in the *New York Medical Journal*.

The second part of the preventive treatment is intended to diminish the activity of the exciting causes until the

organism can adapt itself to the new environment and become inured to the disordering sensations.

During the first forty-eight hours it is advisable to remain in bed and sleep as much as possible. The effort to maintain equilibrium is diminished, the confusion through the sight of moving objects is limited, the life of relations is "cabined and confined," consciousness is diminished at last. Four light meals should be taken a day, and very little fluid drank. The danger of a mechanical hyperæmia of the nerve centers by excessive muscular tonicity forcing the blood out of the musculo-venous reservoir will be obviated. The only drink should be a single cup of hot water with each meal.

After the expiration of this preliminary period, during which the action of the exciting cause is weakened and the organism is being accustomed to the disordering sensations, the time, except that which is regularly given to sleep, should be spent in the open air on deck. The sensory vertigo which is ever ready to arise into consciousness must be supplanted by purposive movements, the efficiency of which can be verified, as walking, etc., and by mental occupation or diversion. It is well known that intense fear or excitement or absorbing thought will dissipate "the swooning sickness on the dismal sea." The vertiginous sensation is driven out of consciousness by the commanding presence of a powerful emotion, feeling, or thought.

A widely known method of diminishing the action of the exciting cause is by the use of the bromide of sodium, which must be pushed to its full physiological effects and the influence kept up during the entire voyage. The neuromuscular disorder is controlled, and sensory perception, both peripheral and central, is dulled. The drug influences favorably the simple vertigo; prevents the development of the hyperæmia; but it intensifies the misery of the anæmic

form. The treatment is often efficient, but it should never be tried except on the advice and under the supervision of a physician. Seasickness itself is not so harmful as may be bromization. The large doses usually upset the stomach, and the drug irritates all the organs by which it is eliminated. The bromides when pushed to the point of poisoning often exert a persistent and pernicious influence on the nervous system.

The treatment during the attack is quite different in the anæmic and hyperæmic varieties.

When hyperæmia is present, the influence of the exaggerated reflex muscular tonicity can be diminished by voluntary muscular movements, which require muscular relaxation as well as contraction for their performance. The vertical position is an advantage. A hot foot bath will also draw the blood away from the nerve centers, as keeping the feet in very hot water for some time has produced syncope. A very powerful effect can be produced by placing the hands and feet in hot water and applying ice to the head and spine. Counter-irritation is a procedure of questionable utility. Caffeine will suppress the sense of central fatigue. Antipyrine or bromide of sodium by the rectum may be of some use.

In the anæmic stage such drugs as must be absorbed to produce an effect should be given hypodermically. Atropine is the best drug to stimulate the parietic sympathetic, but nitroglycerin must be given simultaneously to dilate the arterioles. Strychnine and the natro-benzoate of caffeine also meet obvious indications. Ergotin, on account chiefly of its action on the urine, is also valuable. The judicious use and combination of these five remedies will meet the indications from the side of the muscular, nervous, and circulatory systems. Whisky (and food also) may be required by the rectum. The horizontal position, with

the head low, should be persistently maintained. The vomiting will also be favorably influenced by the preceding drugs. Copious draughts of hot water to wash out and soothe the stomach is a remedy of very great value. Frequently repeated and small doses of creasote, with lime water and an infinitesimal quantity of ipecac, may be effectual. Oxalate of cerium, in five-grain doses every hour for three or four administrations, is another good remedy. If these preventive precautions and remedies fail, the patient must content himself until he can again get into his element—the place where he was created and educated to live—on land. “For Heaven’s sake, let us get ashore,” is a universal conclusion. “Pray, captain,” quoth Tristram Shandy, “is a man never overtaken by death in this passage across the Channel? What a brain! upside down! hey dey! the cells are broke loose one into another, and the blood, and the lymph, and the nervous juices, with the fixed and volatile salts, are all jumbled into one mass! Good God! everything turns round in it like a thousand whirlpools. Sick! Oh, I am deadly sick! ’tis the most discomforting sickness. I wish I was at the bottom; for Heaven’s sake, let us get ashore!”

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